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(54) Improvements in or relating to teat cups and teat cup liners

(57) A liner 5 for teat cups used in automatic milking apparatus, particularly hydraulic milking. The liner mouthpiece diaphragm 8 has a number of apertures 18 each with a closure stop 20. The apertures 18 are closed, by the natural movement of the diaphragm 8, as the associated teat cup is fitted onto a cow teat, and the apertures 18 are opened, to release the interior vacuum, by the natural movement of the diaphragm 8 as the teat cup is removed. Such an arrangement facilitates the removal of the teat cups and liners from cow teats.

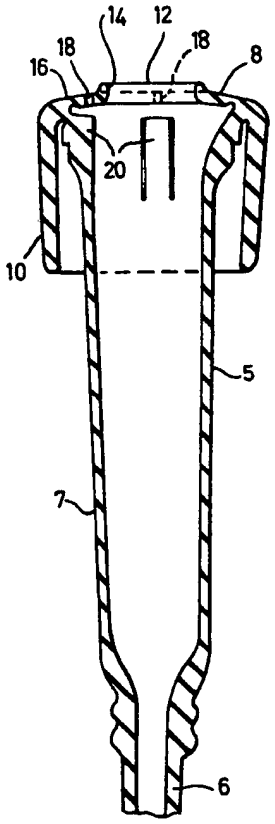

FIG.6.

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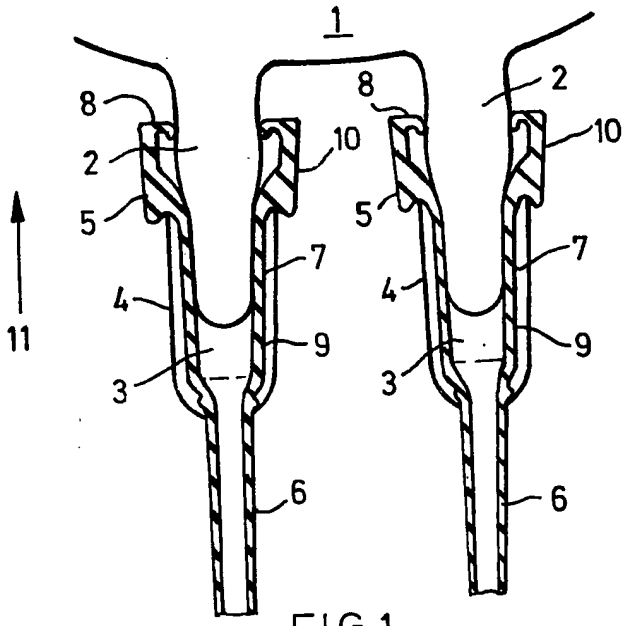


FIG.1.

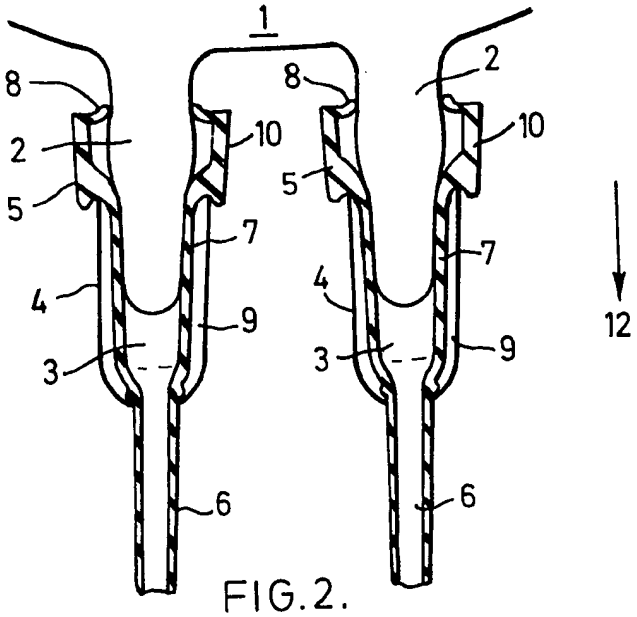


FIG.2.

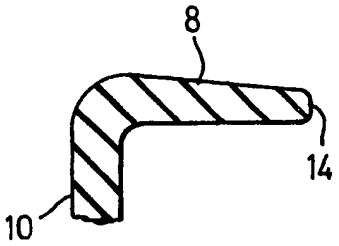


FIG.3.

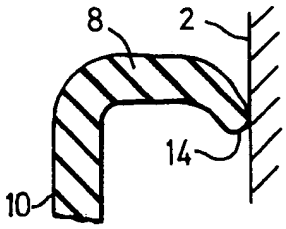


FIG.4.

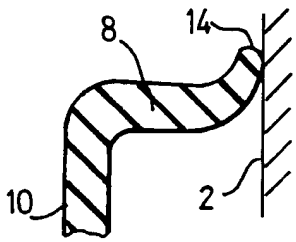
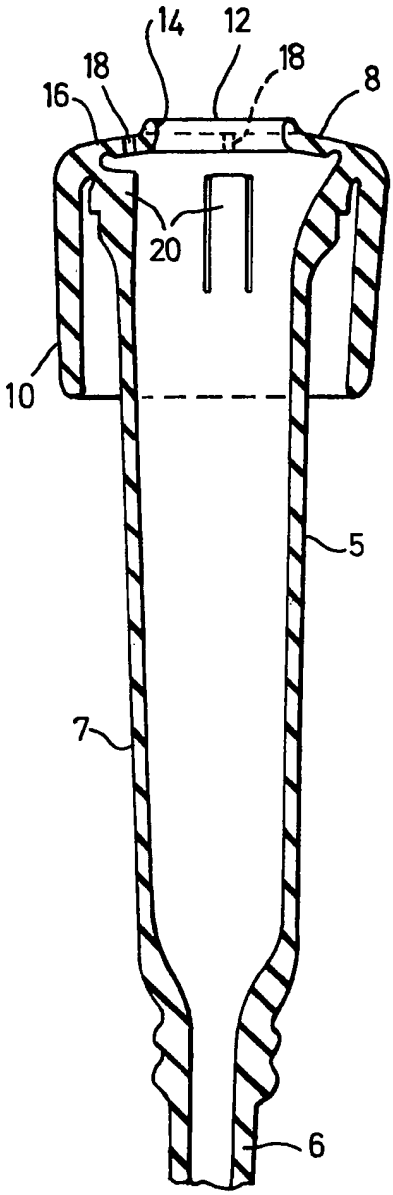


FIG.5.



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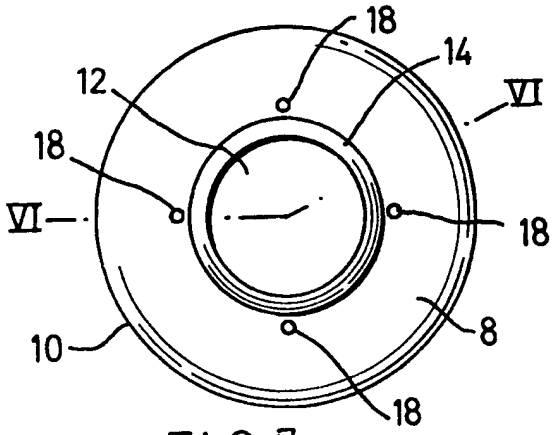

FIG.7.

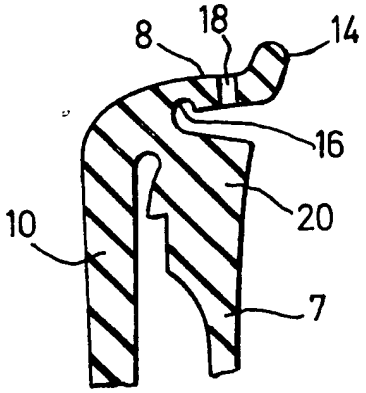

FIG.8.

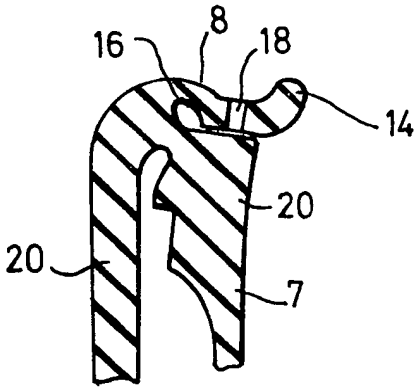

FIG.9.

SPECIFICATION

Improvements in or relating to t at cups and teat cup liners

Background of the Invention

This invention relates to teat cups, and more particularly to teat cup liners, for use in automatic milking apparatus.

Automatic milking apparatus includes, for each cow milking unit, a clawpiece and a cluster of four teat cups connected to the clawpiece by short milk tubes.

For milking, the four teat cups are placed around the cow's teats and are held in position during the milking operation by adhesion, due to the vacuum applied for the milking operation.

In conventional milking methods, in which a continuous air bleed is provided at, or upstream of, the clawpiece, this vacuum-induced adhesion is automatically broken, when the milking operation stops, so that the teat cup cluster is easily removed from the milked cow.

However, a more modern milking method, known as the hydraulic milking method, has been introduced in which there is no air bleed at, or upstream of, the clawpiece and in consequence the vacuum-induced adhesion is not automatically broken after milking, so that the teat cup cluster is more difficult to remove from the milked cow.

The object of the present invention is to provide teat cups with an improved liner which facilitates removal of the teat cup cluster after milking by the hydraulic milking method.

An invention with this same object was described in our co-pending patent application No. 8520814 and that invention and the present invention are similar insofar as both inventions provide a teat liner having a mouthpiece in which the natural movement of the mouthpiece diaphragm upon fitting the associated teat cup onto a cow teat, which is downwardly relatively to the body of the liner, seals the liner to interior vacuum, whereas the natural movement of the mouthpiece diaphragm upon removal of the teat cup from the cow teat, which is upwardly relatively to the body of the liner, releases the interior vacuum.

The earlier invention referred to above makes use of the rolling action of the mouthpiece diaphragm edge on fitting and removal, together with a grooved portion of the mouthpiece diaphragm edge.

The present arrangement mak s use of an apertured mouthpiec diaphragm with associated stops.

Short Description of the Drawings

The principle of the present invention and an embodiment thereof will be described in detail, the embodiment being by way of example, with reference to the accompanying drawings, in which:

Figure 1 is a diagram showing two teat cups of a cluster in position for milking and showing particularly the liner mouthpiece profile during milking;

Figure 2 is a diagram, corresponding to that of Fig. 1, showing particularly the liner mouthpiece profile after milking, at the time of removal;

Figures 3, 4 and 5 are a set of three diagrams showing a teat cup liner mouthpiece of simple cross-section in three different positions corresponding respectively to the rest position, the milking position and the removal position;

Figure 6 is a section view of a teat cup liner in accordance with the present invention, taken in the intersecting planes VI–VI of Fig. 7;

Figure 7 is an end elevation view showing the mouthpiece diaphragm of the teat cup liner of Fig. 6;

Figure 8 is an enlarged, detail view of part of the section view of Fig. 6; and

Figure 9 is a view, corresponding to that of Fig. 8, showing the mouthpiece diaphragm, when fitted onto a cow teat.

Description of the Embodiment

Known automatic milking apparatus includes, for each cow milking unit, a clawpiece and a cluster of four teat cups connected to the clawpiece by four short milk tubes and reference will be made to Fig. 1 to describe the known construction and manner of operation of the teat cups, since the construction of teat cup according to the invention follows the known construction in most respects.

In Fig. 1 and Fig. 2, a cow udder is shown at 1 and two teats at 2, two test cups being shown at 3. Each teat cup 3 has a rigid shell 4 and a teat cup liner 5. The liner 5 is a flexible, moulded member which fits into and seals onto the upper lip of the shell 4. Usually, as shown, the short milk tube 6 is moulded integrally with the teat cup liner 5. The teat cup liner itself comprises a barrel 7 and a mouthpiece diaphragm 8. The liner mouthpiece diaphragm 8 is positioned above the shell 4 and the liner barrel 7 lies within the shell 4 leaving an annular space 9 between the shell inner wall and the barrel outer face.

The liner mouthpiece diaphragm 8 is a circular apertured membrane extending inwardly from the top of the upper wall part 10 of th liner 5.

For milking, the t at cups 3 are fitted over the teats 2 as shown in Fig. 1 and Fig. 2. During milking, vacuum pr ssur and atmospheric pressure ar appli d alternat ly to the annular space 9, by way of a line connected to the teat cup shell 4, not shown in the drawings. The short milk tube 6 also conveys

vacuum pressure from the clawpiece to th interior space of the liner 5 below and around the teat 2.

In the conventional milking systems, having a continous air bleed into that part of the system between the liner mouthpiece diaphragm 8 and the clawpiece, the vacuum in the liner interior space is lost when the milking operation stops and the teat cup 3 cluster is readily removed from the teats 2 of the milked cow.

In a milking system such as that described in copending patent application No. 8512941, wherein no air bleed is permitted into the system up-stream of the clawpiece, the vacuum in the liner interior space is not lost and the teat cup cluster is not readily removable from the teats of the milked cow.

We now continue with the description of the accompanying drawings in the context of the present invention.

In Fig. 1, which corresponds to the fitting of the teat cup cluster and to the milking condition, it will be noted that the mouthpiece diaphragm 8 is turned downwardly against the side of the teat 2. This disposition is due, initially, to the motion of the teat cup, when being fitted, in the upward direction of arrow 11. During milking, it is retained in the same position by the vacuum within the interior space of the liner 5.

Referring, now, to Fig. 2, the initial motion of removal, in the downward direction of arrow 12, causes the mouthpiece diaphragm 8 to lift relatively to the body of the liner 5.

This feature is illustrated more clearly with reference to Figs. 3–5. Figs. 3–5 show in cross section one side of a conventional teat cup liner 5, showing part of the upper wall part 10 and one side of the diaphragm 8 extending inwardly to form the diaphragm aperture of the mouthpiece diaphragm 8. Fig. 3 shows the tapered section of the diaphragm 8 to the inner aperture face 14 and further shows the disposition of the diaphragm when the teat cup is not fitted onto a teat. Fig. 4 shows the downwardly turned disposition of the diaphragm 8 when the teat cup is fitted, the teat face being shown at 2. This is also the disposition during milking. Fig. 5 shows the upwardly turned disposition of the diaphragm 8 when the teat cup is urged downwardly.

Fig. 6 shows an embodiment of the present invention, parts corresponding to those of the known teat cup lin r of Figs. 1–5, b ing indicated by the sam r f rence numbers. Thus, the t at cup liner 5 of Fig. 6 has a wall part 10, which s als onto a teat cup shell, not shown, and a barrel part 7, which extends downwardly to a short milk tube 6. The mouthpiec diaphragm 8 xtends across the top of th wall part 10, the actual mouthpi ce 12 being defined by a ribbed inner edge 14 of the diaphragm 8.

Comparing th vi w of Fig. 6 with those of Figs. 1–5, and more particularly the nlarged section views of Figs. 8 and 9 with those of Figs. 3–5, it will be noted that the diaphragm 8 is of substantially uniform thickness, between the wall 10 and the ribbed edge 14, except for a circular region of less thickness at 16. This weakened region provides a circular hinge causing the annular part of the diaphragm between the region 16 and the mouthpiece 12 to move more in the manner of a flap, rather than merely curl up or down, as shown for the conventional diaphragm, in Fig. 5 and Fig. 4, respectively.

The diaphragm 8 is provided with a series of small apertures 18, arranged in a circle around the mouthpiece 12. In the example shown, four such apertures 18 are provided, at 90 degree intervals, as shown particularly in Fig. 7.

Extending inwardly from the barrel part 7 are a corresponding number of stops 20, each having a top face against which the corresponding aperture 18 closes, when the diaphragm 8 is urged downwardly.

The action of the diaphragm 8 will be evident from the two detail views of Fig. 8 and Fig. 9. In the normal rest, or unfitted, position of the mouth-piece diaphragm 8, as shown in Fig. 8, the apertures 18 are free and the interior of the liner 5 is vented to atmosphere. When the teat cup is fitted onto a cow teat, during which the diaphragm 8 is urged downwardly, the apertures 18 are all sealed against the corresponding stops 20, as is shown in Fig. 9. During milking, the diaphragm 8 is retained in this sealing position by the interior vacuum and exterior atmospheric pressure. When milking has been completed and the teat cup is moved downwardly for removal, the diaphragm 8 is urged upwardly, relatively, so that the apertures 18 are lifted from the stops 20 and the liner interior again vented to atmosphere, as shown in Fig. 8.

CLAIMS

1. For automatic milking apparatus, particularly hydraulic milking apparatus, a teat cup liner having a mouthpiece diaphragm with an aperture or apertures extending from the underside to the outside thereof, the aperture or each aperture being associated with a closure stop disposed in relation to the aperture so that the aperture is closed as the associated teat cup is fitted onto a cow teat and opened as the said teat cup is removed, wh reby interior vacuum within the liner is retained after fitting and released upon removal of the said teat cup.

2. A teat cup liner as claimed in Claim 1, in which a plurality of apertur s through the mouthpi ce diaphragm are spaced apart around the mouthpiece opening.

3. A teat cup liner as claimed in Claim 2, in which each apertur has an associated clo-

sur stop integrally m ulded insid the teat cup lin r each closur stop having a top fac against which the corresponding aperture closes when the diaphragm is urged downwardly towards the interior of the liner.

4. A teat cup liner as claimed in Claim 3, in which the mouthpiece diaphragm cross-section along any radius shows a ribbed edge around the mouthpiece opening, a substantially uniform thickness from the ribbed edge outwardly and an outer circular region of less thickness, before the mouthpiece diaphragm joins the liner barrel part.

5. A teat cup liner as claimed in Claim 1, constructed substantially as described herein with reference to Figs. 6 to 9 of the accompanying drawings.

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